

## 2.1 Biodiversity and Evolution – Answers

1. (a) *Lugworm* segmented body; septa; fluid filled body cavity;  
hydrostatic skeleton; primitive brain and nervous systems;  
thin permeable skin; closed circulatory system; (not: coelom)  
(Max 2) [2]  
*Frog* Phylum Chordata / chordate, accept vertebrate; [1]  
Class Amphibia; [1]  
*Locust* Phylum Arthropoda / arthropod; [1]  
class Insecta / insect; [1]  
Features of phylum  
a body divided into segments  
a body further divided into head, thorax and abdomen/three sections  
a well developed brain  
a hard outer exoskeleton (made of chitin)  
(paired) jointed legs (not: ref. 6)  
an open circulatory system/haemocoel  
a cavity which surrounds the body organs  
(Max 2) [2]  
*Field mushroom* Kingdom fungi; [1]
- (b) *Schistocerca*. [1]

**[10 marks]**

2.

One mark for each line:-

Animalia: Fungi: Protoctista: Plantae: Prokaryotae. [5]  
(no mark if extra ticks present)

**[Total 5 marks]**

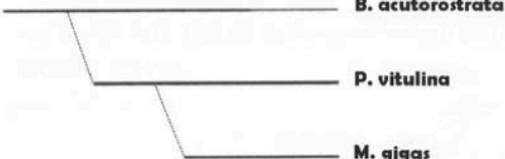
3.

- |     |  |     |
|-----|--|-----|
| (a) | Wings of birds and bats.   | [1] |
| (b) | (i) Adaptive radiation ( <b>Allow</b> Speciation / Natural Selection)  | [1] |
|     | (ii) No competition from other birds / vacant niches / subsequent intraspecific competition (Any two)                              | [2] |
| (c) | Unable to interbreed and produce fertile offspring<br>(allow: breed together. Not: unable to breed)                                | [1] |
| (d) | DNA profiling/hybridisation (comparing DNA or equivalent e.g. fingerprinting)<br>(not: looking at DNA/electrophoresis unqualified) | [1] |

**[Total 6 marks]**

4.

- |     |  |   |
|-----|--|---|
| (a) | Chordata/chordates (accept vertebrata/vertebrates).                                    | 1 |
| (b) | (i) Pentadactyl (limb).  | 1 |
|     | (ii) B.  | 1 |
|     | (ii) Phoca.  | 1 |
| (c) | (i) Homologues/homologous. (not: analogous/adaptive radiation)                         | 1 |
|     | (ii) They suggest the existence of shared/common ancestors<br>(not: similar ancestors) | 1 |
| (d) | (i) 6.   | 1 |
|     | (ii) Macroderma gigas.   | 1 |

- |     |   |   |
|-----|---|---|
| (e) |  | 1 |
|-----|---|---|

**9 MARKS**

- 5.
- |     |                                       |     |
|-----|---------------------------------------|-----|
| (a) | Segmented body                        | [1] |
|     | Jointed limbs                         | [1] |
| (b) | Water proof – terrestrial adaptation  | [1] |
|     | Limits growth / necessitates moulting | [1] |
| (c) | Class                                 | [1] |

**[Total 5 marks]**

- 6.
- |     |                                 |  |   |
|-----|---------------------------------|--|---|
| (a) | Chordata                        | (allow: vertebrata)  | 1 |
|     | Mammalia/mammals                |  | 1 |
|     | <i>Acinonyx</i>                 |  | 1 |
| (b) | Phylum:                         | vertebral column/backbone<br>well developed brain/CNS enclosed in a cranium<br>internal skeleton<br>(any 1)  | 1 |
|     | Class:                          | endothermic (not: warm blooded)<br>Lungs<br>Hair / fur<br>Double circulation<br>Internal gestation / mammary glands / feed young<br>on milk (allow: give birth to live young / placenta) |   |
|     |                                 | Sweat glands<br>(any 1)  | 1 |
| (c) | (Genetic/population) bottleneck | (not: low gene pool)   | 1 |
| (d) | (i)                             | Electrophoresis<br>Genetic/DNA fingerprinting / DNA hybridisation / DNA<br>profiling (not: DNA analysis) / protein sequencing<br>(any 1)   | 1 |
|     | (ii)                            | That the DNA / sequence of bases/ genes/proteins shared<br>between individuals is very high / closely match<br>(allow: ref. banding patterns very similar)                               | 1 |

**Total 8 marks**

7.			
(a)	(i)	Arthropoda	1
	(ii)	jointed legs	max 2
		exoskeleton	
		fluid-filled body cavity / haemocoel/ open circulatory system	
		Segmentation/ segmented body NOT large brain	
(b)	(i)	a group of organisms that can interbreed / breed with each other to produce fertile offspring	1
	(ii)	<u>Genus</u>	1
	(iii)	DNA base sequencing / hybridisation/ sequencing analysis/ DNA electrophoresis Not DNA analysis/ analysis alone genetic fingerprinting or profiling/ amino acid sequencing of proteins / differences in protein structure (not: biochemical methods unqualified) NOT compare DNA/ genes	1
	(iv)	high level of <u>similarity</u> shows that they are closely related / converse argument. Needs to relate to 2 a (iii)	1
<b>Question Total</b>			<b>7</b>

8.		
(a)	A species is a group of organisms that <u>{can interbreed/ reproduce}</u> ; (under natural conditions) produce <u>fertile</u> offspring;	2
(b)	(i) birds;	1
	(ii) Borneo {1.61/ 1.62/1.6};	1
	(iii) (Least at poles to) {greatest/ increasing} at equator;	1
(c)	(i) X at second split from left or anywhere along that line;	1
	(ii) Same genus( but different species)/ tells us the genus;	1
(d)	(i) homologous;	1
	(ii) analogous;	1
<b>Question 1 total</b>		<b>[9]</b>

9.

(a)		<table><tr><td>Kingdom</td><td>Phylum</td><td>Class</td><td>Genus</td></tr><tr><td>Planta(e)/ plant(s);</td><td></td><td></td><td></td></tr><tr><td></td><td>Annelid(s)/ annelida</td><td></td><td></td></tr><tr><td></td><td>Vertebrate/ vertebrata/ chordate/ chordata;</td><td></td><td></td></tr><tr><td></td><td></td><td>Insect/ insecta;</td><td></td></tr></table>	Kingdom	Phylum	Class	Genus	Planta(e)/ plant(s);					Annelid(s)/ annelida				Vertebrate/ vertebrata/ chordate/ chordata;					Insect/ insecta;		4
Kingdom	Phylum	Class	Genus																				
Planta(e)/ plant(s);																							
	Annelid(s)/ annelida																						
	Vertebrate/ vertebrata/ chordate/ chordata;																						
		Insect/ insecta;																					
(b)	(i)	A = Fungi; B = Protoctist(a)/ protoctists/ protists; NOT protozoa	2																				
	(ii)	A (reproduce by) spores/ hyphae/ mycelium/ chitin walls/ heterotrophic/ saprophytic/ eukaryotic; Accept description of saprophytic B membrane bound organelles present/ eukaryotic/ no tissue differentiation/ (mainly) single celled organisms/ unicellular;	2																				
		<b>Question 1 total</b>	<b>[8]</b>																				

10.

Characteristic	Plant;	Animal; Accept animalia	Prokaryote; Accept prokaryotic	Protoctista; NOT protozoa/ fungi
Eukaryotic	✓	✓	✗	✓
Chloroplast	✓	✗	✗	Some species
Cell wall	✓	✗	✓	Some species
Nucleus	✓	✓	✗	✓

4

**Question 1 total****[4]**

## 11. NOTE THIS IS AN OLD SPEC QUESTION

- (a) ~~animalia, plantae, fungi, monera/prokaryotae, protocista~~  
- all five for 2 marks, 1 wrong or more than 5 for 1 mark  
(not: ~~protist/protozoa~~) 2
- (b) (i) phylum, class, order, family, genus  
(1 mark for order, 1 mark for size) 2
- (ii) meat eating (predator)/large canine/carnassial teeth/  
powerful jaws/vertical movement of jaw  
(not: carnivore/feeds on other animals) 1
- (iii) shortened muzzle/retractile claws/fewer teeth than ~~canidae~~  
(not: fewer teeth ~~unqual~~; (ii) and (iii) independent marks) 1
- (c) (i) Genus and Species, 1 for each 2
- (ii) avoids confusion of local common names/different  
languages i.e. ref. to naming or identifying  
(not: Latin understood by all) 1
- [9]

## 12.

- (a) 2, 5, 4, 7, 6, 1, 3 [1]
- (b) ~~Protocista~~;  
  
Fungi;  
  
~~Animalia~~;  
  
Plantae;  
  
(c) Cell Wall of ~~murein~~ / not cellulose;  
(~~not~~: chitin)  
  
No nuclear membrane/nucleus;  
  
Circular DNA;  
  
DNA not associated with histones; [Max 3]  
  
No membrane bound cell organelles /mitochondria/  
~~chloroplasts~~ etc.;  
  
Small ribosomes/70S ribosomes  
(~~not~~: large)  
  
No meiosis;  
Plasmids  
  
(d) Offspring infertile [1]

Part B is from the old specification.

13.

- (a) Chordata

Pisces/Fish

[2]

- (b) Unable to reproduce/interbreed with each other to produce fertile/viable offspring; (*not; they cannot reproduce*)

Any sensible reason for not interbreeding, e.g. behaviour.  
(not: geographical isolation)

Have different characteristics/features/appearance.

Any 2

[2]

- (c) Reference to DNA/genetic fingerprinting/base sequencing/  
immunological comparison;

Close similarities should be present between the species.  
(i.e. technique and related result)

[2]

14.

- (a)

Kingdom	<u>Animalia</u>
Phylum	<u>Chordata</u>
Class	<u>Mammalia</u>
<u>order</u>	<u>Carnivora</u>
<u>family</u>	<u>Felidae</u>
Genus	<u>Panthera</u>
Species	<u>tigris</u>

- (b) More closely related, fewer number of differences / high number of shared genes. ora (comparison needed)

[1]

(Total 7)



15.

- (a) (i) Order
- (ii) Family
- (iii) Genus
- (iv) Species

[4 correct = 2 marks   3 correct = 1 mark] [2]

(b) (i) (Two names first name = )genus [1]

(Second name =) species [1]

(ii) *Panthera tigris* (not: *P. tigris*) [1]

(iii) *Equus zebra* and *Gorilla gorilla* both for [1]  
(not: *E. zebra*/*G. gorilla*?*zebra/gorilla*)

(c) (i) Genetic/DNA/RNA fingerprinting / (gel) electrophoresis [1]  
(not: DNA profiling)

(ii) They split/cut the DNA/RNA into fragments [1]  
(not: ref plasmids)

At specific points/ sequences/bases/ into a number of fragments of specific size [1]

(iii) *Equus asinus* and *Equus zebra* [1]

(iv) They belong to the same genus/differ only by species [1]

And will therefore share more common/similar DNA [1]

**Total 12**

## Essays

1.

(a) *Darwin*

- A. Darwin recognised that species did change/ put forward a theory as to how they changed;
- B. mutation qualified;
- C. Overproduction;
- D. Numbers remain constant/high mortality rate/struggle for survival;
- E. Variation e.g. beak size or shape/rats/moths;
- F. competition (for limited food source);
- G. Individuals with a beneficial variation survive / survival of fittest or converse;
- H. pass on beneficial characteristic;
- I. Repeats generation after generation; (not: over a long time)
- J. details of beak adaptation, seed, insects, fruit etc;
- K. Natural selection;
- L. adaptive radiation qual;
- M. morphologically similar and to mainland form/common ancestor;
- N. similarities of proteins/enzymes;
- O. similarities of DNA/genes;
- P.+ Q AVP x2 e.g. Fossil evidence, living intermediate forms, pentadactyl limb;

(Any 10)

2.

- A = Prokaryotes are unicellular organisms;
- B = No cellulose cell wall / Murein;
- C = No membrane bound internal structures / organelles /  
no nuclear membrane;
- D = Protoctista possess membrane bound organelles;
- E = No tissue differentiation;
- F = Fungi consist of hyphae / mycelium;
- G = Cell wall of chitin;
- H = Reproduction is by spores;
- I = Plants carry out photosynthesis/ autotrophic;
- J = Possess chloroplasts / membrane bound organelles;
- K = Cellulose cell walls;
- L = Animals are heterotrophic;
- M = Show nervous co-ordination;
- N = cells lack a cell wall;
- O = Names of five Kingdoms;

**Question total      10**